



NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety
Washington, D.C. 20594

March 7, 2022

HELICOPTER SPECIALIST'S FACTUAL REPORT

NTSB No: WPR20LA130

A. ACCIDENT

Operator: Southwest Rotors
Aircraft: Bell UH-1H, registration N3276T
Location: Mesa, Arizona
Date: April 24, 2020
Time: 1600 mountain standard time

B. GROUP

No group was formed.

LIST OF ACRONYMS

ATT	aircraft total time
AZ	Arizona
CFR	<i>Code of Federal Regulations</i>
CTSN	component time since new
DMWR	Depot Maintenance Work Requirement
FAA	Federal Aviation Administration
NTSB	National Transportation Safety Board
S/N	serial number
TCDS	Type Certificate Data Sheet
TM	technical manual
TRGB	tail rotor gearbox

C. SUMMARY

On April 24, 2020, about 1600 mountain standard time, a Bell UH-1H helicopter, N3276T, was substantially damaged after it impacted terrain in Mesa, Arizona (AZ). The pilot was fatally injured and

a passenger was seriously injured. The helicopter was operated as a Title 14 *Code of Federal Regulations* (CFR) Part 91 relocation flight. Witnesses reported observing the helicopter flying low toward Falcon Field Airport in Mesa, AZ with white smoke coming from the vicinity of the tail rotor. Suddenly, the tail rotor separated from the helicopter and landed in a dirt lot below. The helicopter continued northeast as it started to spin and subsequently impacted the ground.

D. DETAILS OF THE INVESTIGATION

1.0 ACCIDENT HELICOPTER TAIL ROTOR GEARBOX (TRGB)

The accident helicopter had airframe serial number (S/N) 69-15911 and was type certificated in the restricted category under the Federal Aviation Administration (FAA) Type Certificate Data Sheet (TCDS) No. H7SO, held by Overseas Aircraft Support Inc. At the time of the accident, TRGB S/N B13-2421E was installed on N3276T.

The tail rotor assembly, TRGB (also known as the 90-degree gearbox), input quill assembly, and a portion of the vertical stabilizer containing the TRGB attachment were shipped to the National Transportation Safety Board (NTSB) Materials Laboratory for examination. The examination found evidence of progressive crack growth on the remnant mounting studs within the TRGB housing. Additionally, multiple layers of primer, paint, and sealant were observed on the input quill assembly, including beige-tinted white paint on the mating flange clamping surface (to the vertical stabilizer). Furthermore, beige-tinted white paint was also observed on the input quill mating face on the vertical stabilizer as well as the washer seating faces for the TRGB attachment hardware. NTSB Materials Laboratory Report No. 21-017 contains additional details of the examination findings and can be found in the docket for this investigation.

2.0 MAINTENANCE

2.1 TRGB MAINTENANCE HISTORY

The Hobbs meter was observed in the wreckage and reflected 228.1 hours. Based on this Hobbs times, the aircraft total time (ATT) was calculated to be about 11,930.9 hours and the TRGB CTSN was calculated to be about 5,297.4 hours.

According to aircraft records, TRGB S/N B13-2421F was previously removed from airframe S/N 64-13880 on September 6, 2012 at a component time since new (CTSN) of 5,069.3 hours due to failing serviceability checks caused by metal accumulation. On November 19, 2012 the TRGB was repaired by replacing the main input seal followed by painting of the TRGB by Heliponents, Inc. in Mesa, AZ.^{1,2} The repair records available to investigators did not provide details on the source or quantity of metal found in the TRGB. The TRGB was installed on airframe S/N 69-15911 at an ATT of 11,702.8 hours and a CTSN of 5,069.3 hours (about 228.1 flight hours prior to the accident).

¹ The United States Army Depot Maintenance Work Requirement (DMWR) No. 55-1560-127 pertains to the 90-degree gearbox and contains instructions for painting the TRGB. The instructions contain a step to “mask the top part of the outer flange of input quill sleeve and also the entire studs.”

² The FAA requested the detailed work order from the repair station, but those records were no longer available.

On August 19, 2015, at an ATT of 11,773.5 hours and a TRGB CTSN of 5,140.0 hours, the TRGB was drained and serviced with Mobil Jet II oil.³ On July 11, 2018, at an ATT of 11,827.3 hours and a TRGB CTSN of 5,193.8 hours, a TRGB chip light was reported by the pilot. Subsequent inspection of the chip detector found it contained a small amount of carbon build up. The gearbox was drained and serviced with Mobil Jet II oil. The entry also noted that a gearbox oil analysis would be performed within 20 hours (time in service) from this oil change, but this oil analysis was not found in the aircraft records. The TRGB remained installed on the accident helicopter.

On April 8, 2019, at an ATT of 11,891.9 hours and a TRGB CTSN of 5,258.4 hours, multiple maintenance actions were performed on the helicopter, about 39 flight hours prior to the accident. One of these actions included a 1200-hour/24-month TRGB corrosion inspection; no defects were noted. According to Overseas Aircraft Support, the TRGB would need to be removed from the vertical stabilizer in order to perform this TRGB corrosion inspection. In the US Army Technical Manual (TM) 55-1520-210-23-1, a special inspection directs to inspect the holes in the adapter, studs, and base of the TRGB for corrosion every 1200 hours or 24 months. For the accident helicopter, at the end of the maintenance entry for the 1200-hour/24-month inspection performed in April 2019, the mechanic added a line that a retorque of the main rotor mast nut was due in 3-5 hours, by ATT 11,901.9 hours. However, there was no entry for a retorque of the TRGB retaining nuts since it was not required per TM 55-1520-210-23-1.

According to Rotorcraft Support Inc., the accident helicopter arrived at their facility on December 6, 2019. Various maintenance actions were performed in the December 2019 to February 2020 timeframe, with the completed maintenance signoff dated February 27, 2020 at an ATT of 11,924.1 hours and a TRGB CTSN of 5,290.6 hours. During this timeframe, the TRGB oil was drained and flushed due to discolored oil. Furthermore, oil samples were taken from the TRGB and sent for analysis. An oil analysis report, dated December 24, 2019, reported abnormal copper and aluminum wear particle levels within the TRGB oil. The report noted that the oil sample date was December 17, 2019, about 6.8 flight hours prior to the accident. The oil analysis determined the wear levels for copper and aluminum were at 14 parts per million (ppm) and 12 ppm, respectively. The abnormal threshold was 8 ppm for both copper and aluminum. The oil analysis recommended no corrective action at that time, but to resample at the next service interval to monitor these wear particle trends. According to Rotorcraft Support Inc., the next service interval for oil analysis of the TRGB was 25 flight hours.

Attachment 1 of this report contains the TRGB component log card and last repair in on November 19, 2012; the TRGB corrosion inspection performed on April 28, 2019; the December 24, 2019 oil analysis report; and the maintenance sign off dated February 27, 2020.

2.2 HELICOPTER PAINTING

According to an aircraft maintenance entry dated January 25, 2019, at an ATT of 11,891.9 hours and a TRGB CTSN of 5,258.4 hours, the accident helicopter's tail boom and elevators were painted by Arizona Aircraft Painting in Mesa, AZ. According to Arizona Aircraft Painting, the helicopter was towed to their facility. Photographs from this painting activity showed the tail boom remained installed on the aircraft and the TRGB and tail rotor remained

³ According to ExxonMobil, Mobil Jet Oil II is approved to the standard performance classification of US Military Specification MIL-PRF-23699.

installed on the vertical stabilizer (**Figures 1 and 2**). Various photographs showed the TRGB and tail rotor were masked during painting of the tail boom. The upper portion of the vertical stabilizer, to which the TRGB is mounted, was painted black. The elevators were removed from the tail boom, painted separately, and reinstalled onto the tail boom. Attachment 2 of this report contains the maintenance entry for the painting of the tail boom and elevators.



Figure 1. The accident helicopter during painting of the tail boom. (Courtesy of Arizona Aircraft Painting)



Figure 2. The tail boom after painting was completed. (Courtesy of Arizona Aircraft Painting)

3.0 TRGB INSTALLATION PROCEDURES

According to TM 55-1520-210-23-1, installation of the TRGB onto the vertical stabilizer required the six retaining nuts to be torqued 100-140 inch-pounds in a star pattern until all nuts retain the torque value that was initially applied. In the Special Inspections section of TM 55-1520-210-23-1, a subsequent retorque of these nuts was not specified. However, the Special Inspections required a retorque of the tail rotor (hub) retaining nut be performed between 5 to 10 hours of flight after installation of the tail rotor.

In the maintenance manual for the Bell 205A1 and 205B, analogous procedures for the tail rotor gearbox installation required the six retaining nuts to be torqued to 200-235 inch pounds in a star pattern until all nuts retain the torque value that was initially applied. In the Special Inspections section of the Bell 205A1 maintenance manual, a torque check of the retaining nuts is to be performed between 5 and 10 hours of flight after the TRGB installation. The Bell 205B maintenance manual required a retorque of the TRGB retaining nuts after 10 hours of flight but not to exceed 25 hours of flight.

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